

# Dissecting aortic aneurysm diagnosed by echocardiography

## *A pre- and postoperative study*

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*An echocardiographic study was performed in a 38-year-old man with a dissecting aortic aneurysm diagnosed clinically and by cardiac catheterization.*

*The echocardiograms showed normal aortic leaflets within two anterior and two posterior echoes indicating an abnormally dilated aortic root and the false lumen of the aneurysm.*

*After surgical repair the echocardiographic study showed a normal aortic root echogram without any false lumen in the aortic walls.*

*This technique may therefore be useful in the noninvasive diagnosis of this condition.*

Although descriptions of the echoes originating from the aortic root and the aortic leaflets have been published (Feigenbaum, 1972; Feigenbaum and Chang, 1972; Gramiak and Shah, 1968, 1970), there have been few clinical applications of these observations apart from the evaluation of aortic stenosis and the presence of aortic calcification. The echocardiographic study of the aortic root might however be expected to be useful in the diagnosis of dissecting aneurysm of the aorta (Millward, Robinson, and Craige, 1972): the patient to be described was a young man with a dissecting aneurysm of the ascending aorta diagnosed from the usual clinical features and by a cardiac catheterization procedure and an echocardiographic study. The pre- and postoperative findings using this noninvasive technique are described.

### Case report

A 38-year-old man was referred to the 'Ciudad Sanitaria La Paz' for evaluation of chest pain. One year previously the sudden onset of retrosternal pain made him faint; this had happened three times and on the last occasion he was admitted to hospital.

Physical examination revealed a blood pressure of 65/40 mmHg on the right arm, and 95/40 mmHg on the left arm; the heart rate was 60 beats a minute. The neck veins were not distended. The praecordium showed hyperdynamic left ventricular movement. A 2/4 systolic ejection murmur and an immediate diastolic murmur

TABLE *Haemodynamic data*

Site	Pressures (mmHg)	Mean pressures (mmHg)
Right atrium	a = 8 V = 10	7
Right ventricle	35/5 - 10	
Pulmonary artery	35/20	28
Pulmonary capillary wedge	21/10	14
Left ventricle	150/4 - 14	
Aorta	150/60	97

were heard over the aortic area and along the left sternal border. Femoral pulses were present. The electrocardiogram showed an  $\hat{A}$  QRS of 30° and left ventricular hypertrophy. The carotid pulse showed a normal ejection time. Chest x-rays showed an enlarged ascending aorta with normal pulmonary arteries and normal left ventricle.

Cardiac catheterization was performed and the results of pressure measurements are shown in the Table. Serial determinations of blood oxygen saturation were normal. Cineangiograms were obtained with selective injection of 1.5 ml/kg weight of 76 per cent Urografin into the aortic root and left ventricle at 15 kg/cm<sup>2</sup> injection pressure. These showed (Fig. 1a and b) a dissecting aortic aneurysm and grade 2/4 aortic insufficiency.

Echocardiographic studies were performed with a Unirad, 100, 2mHz transducer with a repetition rate of 1000 impulses per second. Left ventricular function studies (Fortuin *et al.*, 1971; Fortuin, Hood, and Craige,

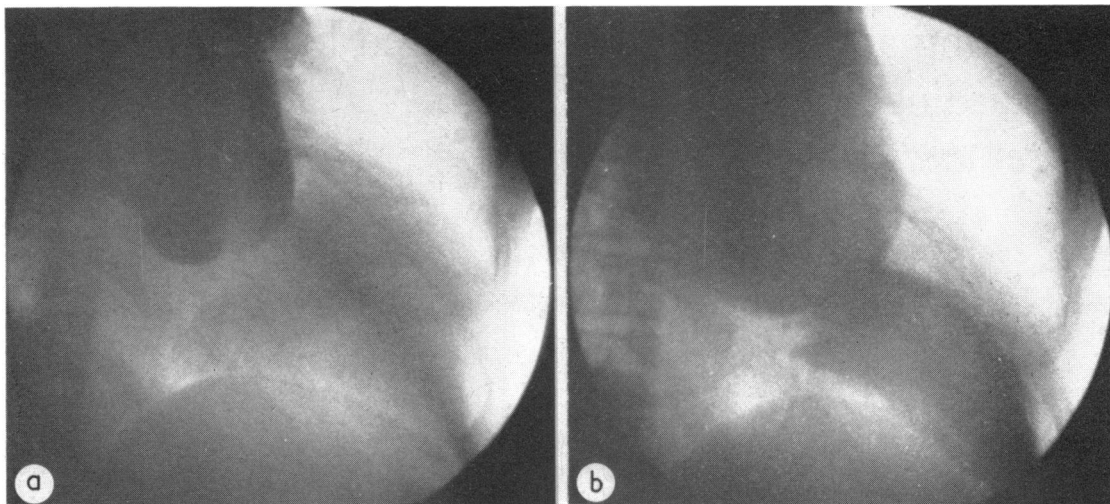


FIG. 1. Angiograms. a) The right anterior oblique projection: early phase of aortography shows the true lumen of the aortic root and mild aortic insufficiency. b) The right anterior oblique projection: ventriculography shows the aortic aneurysm.

1972) showed an ejection fraction of 62 per cent and a VCF of 1.06 circ/sec. Mitral valve echo showed fluttering of the anterior leaflet during diastole. Echocardiograms from the aortic root demonstrated normal aortic leaflets which separated 2 cm with a box-like configuration during systole. The aortic leaflets were recorded usually within the anterior and posterior moving echoes from the aortic root: in this case (Fig. 2a) two anterior and two posterior echoes showed an abnormally dilated aortic root and the false lumen of the aneurysm.

At operation, with the aid of cardiopulmonary bypass and hypothermia (20°C), the dissecting aortic layers were reunited at the site of the intimal tear. No graft replacement or prosthetic aortic valve was necessary. Postoperative clinical studies were satisfactory.

Echocardiographic study of the aortic root after the operation showed a normal aortic root echogram (Fig. 2b) with the aortic leaflets within the anterior and posterior moving echoes from the root, without any false lumen in the wall. The patient was discharged free of symptoms and in excellent condition.

### Discussion

Echocardiography, a non-invasive diagnostic procedure that uses ultrasound to visualize the heart, has been employed to study aortic stenosis, the presence of aortic calcification, and sometimes prosthetic aortic valve movement (Feigenbaum, 1972; Feigenbaum and Chang, 1972; Gramiak, and Shah, 1968, 1970). In the normal subject the two dominant echoes comprising the root of the aorta are separated by 2 to 3.7 cm and pulsate with the cardiac cycle. Aortic leaflets that are separated 2 cm at the onset of the ejection

period, with a typical box-like configuration during systole, remain in a close position during diastole; these echoes can be recorded within the anterior and the posterior aortic root echoes.

Echocardiography of the aortic root was useful in the diagnosis of dissecting aortic aneurysm by showing an abnormally dilated aortic root with normal aortic leaflets which are separated from the main anterior and posterior walls of the aortic root; the walls show two separate dominant echoes due to the dissection of the walls by the aneurysm formation. The normal postoperative aortic root echogram endorsed this assessment.

### References

- Feigenbaum, H. (1972). Clinical applications of echocardiography. *Progress in Cardiovascular Diseases*, **14**, 531.
  - Feigenbaum, H., and Chang, S. (1972). *Echocardiography*, pp. 73-86. Lea and Febiger, Philadelphia.
  - Fortuin, N. J., Hood, W. P., and Craige, E. (1972). Evaluation of left ventricular function by echocardiography. *Circulation*, **46**, 26.
  - Fortuin, N. J., Hood, W. P., Sherman, M. E., and Craige, E. (1971). Determination of left ventricular volumes by ultrasound. *Circulation*, **44**, 575.
  - Gramiak, R., and Shah, P. M. (1968). Echocardiography of the aortic root. *Investigative Radiology*, **3**, 356.
  - Gramiak, R., and Shah, P. M. (1970). Echocardiography of the normal and diseased aortic valve. *Radiology*, **96**, 1.
  - Millward, D. K., Robinson, N. J., and Craige, E. (1972). Dissecting aortic aneurysm diagnosed by echocardiography in a patient with rupture of the aneurysm into the right atrium: rare cause for continuous murmur. *American Journal of Cardiology*, **30**, 427.
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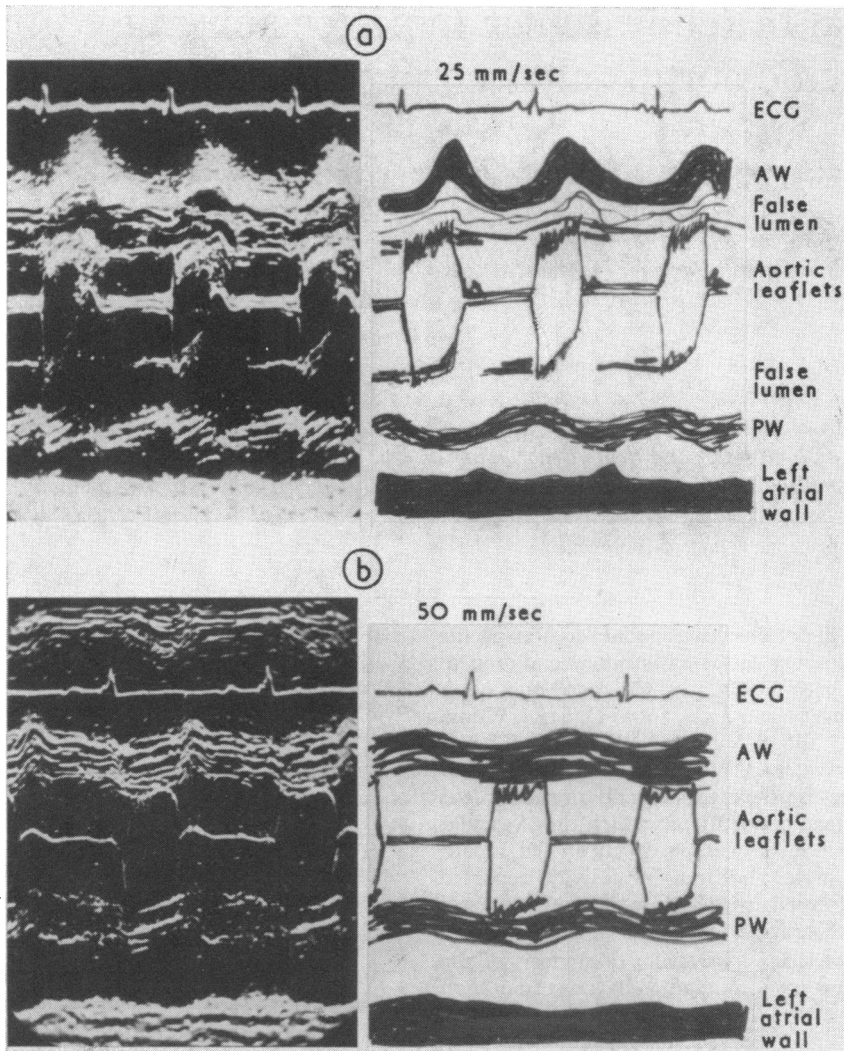


FIG. 2 Echograms. a) Preoperative echogram, showing an abnormally dilated aortic root, normal aortic leaflets, and the anterior and posterior false lumen of the aneurysm. AW = anterior wall of the aortic root. PW = posterior wall of the aortic root. b) Postoperative echogram showing the aortic leaflets within the anterior (AW) and the posterior (PW) echoes from the aortic root, without any false lumen in the aortic walls.